

NIRMA UNIVERSITY

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| Institute: | Institute of Technology |
| Name of Programme: | BTech CSE, Integrated BTech (CSE)-MBA |
| Course Code: | XXXX |
| Course Title: | Advanced Computer Architecture |
| Course Type: | Department Elective-I |
| Year of Introduction: | 2024-25 |

| L | T | Practical Component | | | | C |
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Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. demonstrate an understanding of the fundamental design concepts in computer architecture (BL2)
2. apply the knowledge of computer organization to quantitatively evaluate the performance of a computer architecture (BL3)
3. explain the state-of-the-art computer architectures (BL5)
4. design a prototype of an existing computer architecture module. (BL6)

| Unit | Contents | Teaching Hours (Total 45) |
|----------|---|------------------------------|
| Unit-I | Processor Design Concepts: Review of Basic Computer Organization, Performance Evaluation Techniques, Instruction Pipelining and Performance, RISC Pipeline | 05 |
| Unit-II | Instruction Pipelining: ILP, Pipeline and Control Hazards, Branch Prediction, Pipeline Hazard Analysis, MIPS Pipeline for multi-cycle operations, Pipeline Scheduling, Static and Dynamic Scheduling | 10 |
| Unit-III | Superscalar Processing: Advanced Pipelining, Superscalar Processors, Vector and GPU Architectures, Core Optimization | 08 |
| Unit-IV | Cache Memory: Introduction, Writing/Replacement Strategies, Design Techniques, Cache Optimization | 08 |
| Unit-V | Primary and Secondary Storage Systems: Introduction to DRAM and SRAM, DRAM Controllers and Address Mapping, Design Concepts of DRAM, Secondary Storage Systems | 06 |
| Unit-VI | Tiled Chip Multicore Processors: Introduction, Routing Techniques in Network on Chip, Router Microarchitecture, TCMP and NoC Design Principles | 08 |

Self-Study:

The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study content.

Suggested Readings/ References:

1. John L. Hennessy and David A. Patterson, "Computer Architecture: A Quantitative Approach", Morgan Kaufmann Publishers



2. Kai Hwang and F. A. Briggs, "Computer architecture and parallel processor", McGraw-Hill.
3. Hesham El-Rewini, Mostafa Abd-El-Barr, "Advanced Computer Architecture and Parallel Processing", Wiley.
4. William Stallings, "Computer Organization and Architecture", Prentice Hall.
5. Andrew S. Tanenbaum, "Structured Computer Organization", Prentice Hall.
6. Patterson, J. L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann Publication.

Tutorial Work:

Tutorial work will be based on the above syllabus with a minimum of 8-10 tutorials.

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